Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

Please cancel claims 20-35.

1. (Currently amended) A decoding method comprising:

receiving an encoded signal;

demodulating the received encoded signal to produce soft information; and

iteratively processing the soft information with one or more soft-in / soft-output (SISO) modules, at least one SISO module using a tree structure arranged in a parallel prefix and suffix architecture to compute forward and backward state metrics.

2. (Original) The method of claim 1 wherein the at least one SISO computes the forward and backward state metrics by performing recursive marginalization-combining operations.

3. (Original) The method of claim 2 wherein the recursive marginalization-combining operations comprise min-sum operations.

4. (Original) The method of claim 2 wherein the recursive marginalization-combining operations comprise min*-sum operations.

5. (Original) The method of claim 4 wherein min* = $\min(x,y) - \ln(1 + e^{-|x-y|})$.

6. (Original) The method of claim 2 wherein the recursive marginalization-combining operations comprise sum-product operations.

7. (Original) The method of claim 2 wherein the recursive marginalization-combining operations comprise max-product operations.

8. (Currently amended) The method of claim 1 wherein the encoded signal comprises at least one of a turbo encoded signal, a block turbo encoded signal, a low density parity check coded signal, a product coded signal, and <u>a</u> convolutional coded signal.

9. (Original) The method of claim 1 wherein the encoded signal comprises at least one of a parallel concatenated convolutional code and a serial concatenated convolutional code.

10. (Original) The method of claim 1 further comprising using the iterative decoding method in a wireless communications system.

11. (Original) The method of claim 1 further comprising terminating the iterative processing upon occurrence of a predetermined condition.

12. (Original) The method of claim 1 wherein the iterative processing comprises performing parallel prefix operation or parallel suffix operations, or both, on the soft information.

13. (Original) The method of claim 1 wherein the iterative processing comprises using soft output of a first SISO as soft input to another SISO.

14. (Original) The method of claim 1 wherein the tree structure used by at least one SISO comprises a tree structure that results in the SISO having a latency of $O(\log_2 N)$, where N is a block size.

15. (Original) The method of claim 1 wherein the tree structure used by at least one SISO comprises a Brent-Kung tree.

16. (Original) The method of claim 1 wherein the tree structure used by at least one SISO comprises a forward-backward tree.

17. (Original) The method of claim 16 wherein the forward-backward tree comprises a tree structure recursion that is bi-directional.

18. (Currently amended) The method of claim 1 wherein the <u>iterative</u> processing performed by at least one SISO comprises:

tiling an observation interval into subintervals; and

applying a minimum half-window SISO operation on each subinterval.

19. (Original) The method of claim 1 wherein the iterative processing comprises performing marginalization-combining operations which form a semi-ring over the soft-information.

20-35. (Canceled)

36. (Currently amended) A method of iterative detection comprising:

receiving an input signal corresponding to one or more outputs of a finite state machine (FSM); and

determining [[the]] a soft inverse of the FSM by computing forward and backward state metrics of the received input signal using a tree structure arranged in a parallel prefix and suffix architecture.

37. (Original) The method of claim 36 wherein the forward and backward state metrics are computed by at least one soft-in / soft-out (SISO) module.

38. (Original) The method of claim 36 wherein the forward and backward state metrics are computed using a tree-structured set of marginalization-combining operations.

39. (Original) The method of claim 38 wherein the marginalization-combining operations comprise min-sum operations.

40. (Original) The method of claim 38 wherein the marginalization-combining operations comprise min*-sum operations.

41. (Original) The method of claim 40 wherein min* = $\min(x,y) - \ln(1 + e^{-|x-y|})$.

42. (Currently amended) The method of claim 38 wherein the marginalization-combining operations comprise sum-product operations.

43. (Original) The method of claim 38 wherein the marginalization-combining operations comprise max-product operations.

44. (Original) The method of claim 36 wherein the input signal comprises at least one of a turbo encoded signal and a convolutional coded signal.

45. (Original) The method of claim 36 wherein the input signal comprises at least one of a parallel concatenated convolutional encoded signal and a serial concatenated convolutional encoded signal.

46. (Original) The method of claim 36 wherein determining the soft inverse of the FSM comprises iteratively processing soft information.

47. (Currently amended) The method of claim 46 wherein the iterative processing ~~comprising~~ comprises performing parallel prefix operation or parallel suffix operations, or both, on the soft information.

48. (Original) The method of claim 46 wherein the iterative processing comprises using soft output of a first SISO as soft input to another SISO.

49. (Original) The method of claim 37 wherein the tree structure used comprises a tree structure that results in the SISO module having a latency of $O(\log_2 N)$, where N is a block size.

50. (Original) The method of claim 36 wherein the tree structure comprises a Brent-Kung tree.

51. (Original) The method of claim 36 wherein the tree structure comprises a forward-backward tree.

52. (Original) The method of claim 51 wherein the forward-backward tree comprises a tree structure recursion that is bi-directional.

53. (Original) The method of claim 37 wherein the at least one SISO further:

tiles an observation interval into subintervals; and

applies a minimum half-window SISO operation on each subinterval.

54. (Currently amended) A turbo decoder comprising:

a demodulator adapted to receive as input a signal encoded by a finite state machine (FSM) and to produce soft information relating to the received signal; and

at least one soft-in / soft-out (SISO) module in communication with the demodulator and adapted to compute a soft-inverse of the FSM using a tree structure <u>arranged in a parallel prefix and suffix architecture</u>.

55. (Original) The decoder of claim 54 wherein the tree structure implements a combination of parallel prefix and parallel suffix operations.

56. (Currently amended) The decoder of claim 54 further comprising at least two SISO modules in communication with each

other, wherein the SISO modules iteratively exchange soft information estimates of [[the]]a decoded signal.

57. (Currently amended) The decoder of claim 54 wherein the at least one SISO computes the soft-inverse of the FSM by computing forward and backward state metrics of the received signal.

58. (Currently amended) The decoder of claim 54 wherein the tree structure used by the at least one SISO comprises a tree structure that results in the SISO having a latency of $O(\log_2 N)$, where N is a block size.

59. (Currently amended) The decoder of claim 54 wherein the tree structure used by the at least one SISO comprises a Brent-Kung tree.

60. (Currently amended) The decoder of claim 54 wherein the tree structure used by the at least one SISO comprises a forward-backward tree (FBT).

61. (Currently amended) A method of iterative detection comprising:

receiving an input signal corresponding to output from one or more block encoding modules; and

determining the soft inverse of the one or more block encoding modules by computing forward and backward state metrics of the received input signal using a tree structure arranged in a parallel prefix and suffix architecture.

62. (Original) The method of claim 61 wherein the forward and backward state metrics are computed by at least one soft-in / soft-out (SISO) module.

63. (Original) The method of claim 61 wherein the forward and backward state metrics are computed using a tree-structured set of marginalization-combining operations.

64. (Original) The method of claim 63 wherein the marginalization-combining operations comprise min-sum operations.

65. (Original) The method of claim 63 wherein the marginalization-combining operations comprise min*-sum operations.

66. (Original) The method of claim 65 wherein $\min^* = \min(x,y) - \ln(1 + e^{-|x-y|})$.

67. (Original) The method of claim 63 wherein the marginalization-combining operations comprise sum-product operations.

68. (Original) The method of claim 63 wherein the marginalization-combining operations comprise max-product operations.

69. (Original) The method of claim 63 wherein the input signal comprises at least one of a block turbo encoded signal, a low density parity check coded signal, and a product coded signal.

70. (Currently amended) The method of claim 63 wherein determining the soft inverse of the one or more block encoding modules comprises iteratively processing soft information.

71. (Currently amended) The method of claim 70 wherein the iterative processing ~~comprising~~ comprises performing parallel prefix operations or parallel suffix operations, or both, on the soft information.

72. (Original) The method of claim 70 wherein the iterative processing comprises using soft output of a first SISO as soft input to another SISO.

73. (Original) The method of claim 62 wherein the tree structure used comprises a tree structure that results in the SISO module having a latency of O(log2 N), where N is a block size.

74. (Original) The method of claim 61 wherein the tree structure comprises a Brent-Kung tree.

75. (Original) The method of claim 61 wherein the tree structure comprises a forward-backward tree.

76. (Original) The method of claim 75 wherein the forward-backward tree comprises a tree structure recursion that is bi-directional.

77. (Original) The method of claim 62 wherein the at least one SISO further:

tiles an observation interval into subintervals; and

applies a minimum half-window SISO operation on each subinterval.

78. (Currently amended) A block decoder comprising:

a demodulator adapted to receive as input a signal encoded by a block encoding module and to produce soft information relating to the received signal; and

at least one soft-in / soft-out (SISO) module in communication with the demodulator and adapted to compute a soft-inverse of the block encoding module using a tree structure arranged in a parallel prefix and suffix architecture.

79. (Original) The decoder of claim 78 wherein the tree structure implements a combination of parallel prefix and parallel suffix operations.

80. (Currently amended) The decoder of claim 78 further comprising at least two SISO modules in communication with each other, wherein the SISO modules iteratively exchange soft information estimates of [[the]] a decoded signal.

81. (Original) The decoder of claim 78 wherein at least one SISO computes the soft-inverse of the block encoding module by computing forward and backward state metrics of the received signal.

82. (Original) The decoder of claim 78 wherein the tree structure used by at least one SISO comprises a tree structure that results in the SISO having a latency of O(log2 N), where N is a block size.

83. (Original) The decoder of claim 78 wherein the tree structure used by at least one SISO comprises a Brent-Kung tree.

84. (Original) The decoder of claim 78 wherein the tree structure used by at least one SISO comprises a forward-backward tree (FBT).

85. (Currently amended) An iterative detection method comprising:

receiving an input signal corresponding to one or more outputs of a module whose soft-inverse can be computed by running [[the]] a forward-backward algorithm on a trellis representation of the module; and

determining the soft inverse of the module by computing forward and backward state metrics of the received input signal using a tree structure arranged in a parallel prefix and suffix architecture.

86. (Original) The method of claim 85 wherein the input signal comprises at least one of a block error correction encoded signal, a block turbo encoded signal, a low density parity check coded signal, and a product coded signal.

87. (Currently amended) The method of claim 85 wherein the input signal comprises at least one of a turbo encoded signal and a convolutional coded signal.

88. (Original) The method of claim 85 wherein the encoded signal comprises at least one of a parallel concatenated convolutional code and a serial concatenated convolutional code.

89. (Original) The method of claim 85 wherein the module comprises a finite state machine.

90. (Original) The method of claim 85 wherein the module comprises a block encoding module.

91. (New) A decoding method comprising:

receiving an encoded signal;

demodulating the received encoded signal to produce soft information; and

iteratively processing the soft information with one or more soft-in / soft-output (SISO) modules, at least one SISO module using a tree structure arranged in a parallel prefix architecture to compute forward state metrics.

92. (New) The method of claim 91 wherein the tree structure further comprises a parallel suffix architecture to compute backward state metrics.

93. (New) A method of iterative detection comprising:

receiving an input signal corresponding to one or more outputs of a finite state machine (FSM); and

determining a soft inverse of the FSM by computing forward state metrics of the received input signal using a tree structure arranged in a parallel prefix architecture.

94. (New) The method of claim 93 wherein the tree structure further comprises a parallel suffix architecture and determining the soft inverse of the FSM further comprises determining the soft inverse of the FSM by computing backward state metrics of the received input signal using the tree structure.

95. (New) A turbo decoder comprising:

a demodulator adapted to receive as input a signal encoded by a finite state machine (FSM) and to produce soft information relating to the received signal; and

at least one soft-in / soft-out (SISO) module in communication with the demodulator and adapted to compute a soft-inverse of the FSM using a tree structure arranged in a parallel prefix architecture.

96. (New) The decoder of claim 95 wherein the tree structure further comprises a parallel suffix architecture.

97. (New) A method of iterative detection comprising:

receiving an input signal corresponding to output from one or more block encoding modules; and

determining the soft inverse of the one or more block encoding modules by computing forward state metrics of the received input signal using a tree structure arranged in a parallel prefix architecture.

98. (New) The method of claim 97 wherein the tree structure is further comprises a parallel suffix architecture and determining the soft inverse of the one or more block encoding modules further comprises determining the soft inverse of the one or more block encoding modules by computing backward state metrics of the received input signal using the tree structure.

99. (New) A block decoder comprising:

a demodulator adapted to receive as input a signal encoded by a block encoding module and to produce soft information relating to the received signal; and

at least one soft-in / soft-out (SISO) module in communication with the demodulator and adapted to compute a soft-inverse of the block encoding module using a tree structure arranged in a parallel prefix architecture.

100. (New) The decoder of claim 99 wherein the tree structure further comprises a parallel suffix architecture.

101. (New) An iterative detection method comprising:

receiving an input signal corresponding to one or more outputs of a module whose soft-inverse can be computed by running a forward-backward algorithm on a trellis representation of the module; and

determining the soft inverse of the module by computing forward state metrics of the received input signal using a tree structure arranged in a parallel prefix architecture.

102. (New) The method of claim 101 wherein the tree structure further comprises a parallel suffix architecture and determining the soft inverse of the module further comprises determining the soft inverse of the module by computing backward state metrics of the received input signal using the tree structure.